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REMARKS

The September 16, 2003 Office Action was based upon pending Claims 1-108. In this paper, Claims 1, 33, 34, and 99 are amended. Claims 60-98 and 100-108 are canceled, without prejudice, and new Claims 109-111 are added. (The specification has also been amended to correct a typographical error, namely, "a" has been inserted in line 13 of paragraph [0029].) After entry of this Amendment, Claims 1-59, 99, and 109-111 are pending and presented for further consideration.

Restriction under 35 U.S.C. 121 is required to one of the following groups of claims:

Group I. Claims 1-59 and 99, and

Group II. Claims 60-98 and 100-108.

Applicants affirm election of Group I, Claims 1-59 and 99. Accordingly, Applicants have canceled Claims 60-98 and 100-108. Applicants reserve the right to pursue canceled Claim 60-98 and 100-108 in one or more divisional applications or continuations thereof. New Claims 109-111 have been added based upon canceled claims 100-102, which depended from Claim 99. New Claims 109-111, however, recite the "method of Claim 99" instead of the "diffractive optical element of Claim 99" recited in canceled Claims 100-102. Applicants submit that new Claims 109-111 are appropriate for consideration.

Rejections under 35 U.S.C. 101 and 35 U.S.C. 112, first paragraph

Claims 6, 7 and 24 are rejected under 35 U.S.C. §101 based on the contention that the disclosed invention is inoperative and therefore lacks utility. Claims 6, 7, and 24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The Office Action states that Claims 6, 7, and 24 contain subject matter that was not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention.

With regard to Claim 6, the Office Action states that in the case of purely relief diffractive articles, the refractive index is the same throughout the medium and therefore the only difference is the physical thickness of the adjacent areas. The Office Action continues that if the surface is placed in contact with a material having the same refractive index as the layer having the relief images, the light passes through undiffracted.

Claims 1, however, recites that diffractive features comprising refractive index variations are formed in the layer of curable material. Diffractive features comprising refractive index

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variations may diffract light. Refractive index variations are shown for example in FIGURES 6D, 6E and 7. Discussions of these figures are presented in paragraphs [0049], [0050], [0051], and [0054].

With regard to Claims 7 and 24, the Office Action states that the curing step requires energy from heat, electron beams, or, corona charging to pass through the surface relief pattern to be modulated pattern-wise by the surface relief pattern and to cure the curable material. The Office Action continues that heat, electrons and other electric charges are not patterned by the relief surface. Applicants, however, do not rely on the heat, electrons and other electric charges being patterned by the relief surface. The Office Action also states that electrons and other electric charge cannot pass through the layer bearing the relief images. Applicants disagree. The master may, for example, comprise suitable material and have a thickness such that the high energy electrons can be directed therethrough.

Applicant's therefore respectfully request that the rejections of Claims 6, 7, and 24 under 35 U.S.C. 101 and 35 U.S.C. 112, first paragraph, be withdrawn.

Rejections under 35 U.S.C. 102(b)

Claims 1, 2, 4, 5, 8, 10-12, 18, 32, 34, 41-48 and 99 are rejected under 35 U.S.C. §102(b) as being fully anticipated by Shirasaki, et al., '442 and also as being fully anticipated by Okai et al, '637. Applicants respectfully submit, however, that neither Shirasaki et al nor Okai et al anticipate Claims 1, 2, 4, 5, 8, 10-12, 18, 32, 34, 41-48 and 99.

First, Shirasaki et al and Okai et al teach diffraction and formation of interference fringes. See, for example, Shirasaki et al, column 17, lines 27-39 and 47-57, which describe "transmitted lights 45 and diffracted lights 46" that form a pattern of "interference fringes." See also Okai et al, column 3, line 46, to column 4, line 33, wherein Okai et al teaches that "[i]t is therefore desirable to utilize the interference between the first order diffraction wave and the transmission waves" to form interference fringes as depicted in FIG. 3. In contrast, independent Claims 1 and 99, as amended, specifically recite producing the diffractive features through non-interference effects. Independent Claim 34 recites a non-holographic method comprising non-holographically forming diffractive features in the layer of curable material. Independent Claim 41 recites that the formation of the pattern of diffractive features is dependent on the surface relief features and substantially independent of any diffraction of the energy by the surface relief features.

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Independent Claim 47 recites forming the diffractive features in the layer of curable material by illuminating the contact area with light having an intensity distribution substantially free of interference fringes. Accordingly, Shirasaki et al and Okai et al, which teach diffraction and formation of interference fringes, do not anticipate independent Claims 1, 33, 34, 41, 47, and 99 or the dependent claims that depend therefrom.

Second, Shirasaki et al and Okai et al failed to disclose imprinting the pattern on a surface of the layer of curable material, which is recited in independent Claims 1, 34, 41, 47, and 99. Nowhere does Shirasaki et al state or show imprinting. For example, FIGURES 24-25, do not depict any imprint in the surface of the curable material. Moreover, Okai et al teaches away from imprinting. Column 5, lines 56-59, states that “[i]n order to protect the mask and to remove Newton ring that developed between the photomask 56 and the InP substrate 54, therefore, the exposure was effected by providing a gap of 50 to 250 μm .” Column 6, lines 45-55, cited in the Office Action refer to this same gap. Applicants submit therefore that Shirasaki et al and Okai et al fail to disclose imprinting the pattern on a surface of the layer of curable material as recited in independent Claims 1, 34, 41, 47, and 99 and the claims that depend therefrom.

Applicants also point out that the Office Action does not specify where Shirasaki et al and Okai et al disclose each of the limitations recited in the rejected claims. For example, the Office Action does not indicate where Shirasaki et al and Okai et al show that the curable material comprises polymer selected from the group consisting of urethane, acrylate, and epoxy as recited in Claims 11 and 43. Shirasaki et al and Okai et al also fail to disclose (a) that the contacting creates an interface between the medium, (b) that the layer of curable material has a pattern corresponding to the surface relief pattern and (c) that the method further comprises using the interface pattern to mechanically influence the orientation of microstructures in the layer, which is recited in Claim 12. Shirasaki et al and Okai et al also do not teach that physically contacting the surface relief features comprises forming indentations in the layer of curable material. In addition, the Office Action fails to explain how Shirasaki et al and Okai et al teach each of the limitations recited in Claim 99.

As Shirasaki et al and Okai et al fails to disclose each of the limitation recited in Claims 1, 2, 4, 5, 8, 10-12, 18, 32, 34, 41-48 and 99, Shirasaki et al and Okai et al do not anticipate. Applicants therefore respectfully request that the rejection of Claims 1, 2, 4, 5, 8, 10-12, 18, 32, 34, 41-48 and 99 under 35 U.S.C. §102(b) be withdrawn.

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Rejections under 35 U.S.C. 103(a)

Claims 1-5, 8-23, 25-59, and 99 are rejected under 35 U.S.C. §103(a) in the Office Action, which cites Ikeda, et al., '033, Moss, et al., '417, Haugh, '526, Molteni, et al., '853, Moraw, et al., '633, Ingwall et al. '912, and Sutherland WO 01/90822. Applicants maintain that Claims 1-5, 8-23, 25-59, and 99 are patentable over the cited reference taken alone or in combination.

Ikeda et al, for example, teach diffraction and interference fringes. See, e.g., column 5, lines 7-26, wherein Ikeda et al teach that a "predetermined pattern of interference fringes 19 are formed in the photosensitive layer 15 on bisector lines between the zero-order transmission beams 18 and the first-order transmission diffraction beams 18, as shown in FIG. 6". Ikeda et al, therefore fails to disclose the invention recited in Claims 1-5, 8-23, 25-59, and 99. As discussed above, for example, independent Claims 1, 33, and 99 recite producing the diffractive features through non-interference effects and Claim 34 recites non-holographically forming diffractive features. Independent Claim 41 recites that the formation of the pattern of diffractive features is dependent on the surface relief features and substantially independent of any diffraction of the energy by the surface relief features. Independent Claim 47 recites forming the diffractive features in the layer of curable material by illuminating the contact area with light having an intensity distribution substantially free of interference fringes. Ikeda et al, which teach diffraction and formation of interference fringes, therefore fails to disclose the invention claimed in Claims 1, 33, 34, 41, 47, and 99 or the dependent claims that depend therefrom.

Ikeda et al also fails to disclose imprinting the pattern on a surface of the layer of curable material, which is recited in the claims. In fact, Ikeda et al fails to show a surface relief pattern.

The Office Action states that Moss et al teach that volume holograms have both modulation on the surface (surface relief or thin holograms) and fringes of refractive index modulation throughout the thickness (thick holograms). Applicants respectfully submit that the Moss et al is misinterpreted in the Office Action. In column 2, line 14-16, cited in the Office Action, Moss et al states that a volume transmission hologram has the *properties* of both a thick and a thin hologram. The property referred to by Moss et al is that a surface relief hologram has little or no directional sensitivity and will diffract and reconstruct light from any incoming angle with high efficiency. In column 2, lines 33-37, Moss et al refers to means for removing the thin

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hologram *property* of a volume transmission hologram. Moss et al proceeds to describe periodic variations in index of refraction at the surface of the recording layer as causing the surface to act as a planar phase grating even in the absence of surface deformation. See column 6, lines 7-14. Moss et al explains that the periodic variations in the index of refraction in the outermost thin sheet are a result of the high index contrast ends of the fringes (represented by 4 in FIG. 1b) that define the volume hologram. Moss et al teaches that a gradual interface boundary along the surface regions of the recording medium (see, e.g., Figure 3a) will reduce the diffractive power in those regions. See also column 6, line 57, to column 7, line 22. Moss does not teach that the volume holograms have surface relief. Accordingly, Moss et al is being misinterpreted and misapplied.

Applicants also point out that the Office Action fails to address each of the limitations recited in the rejected claims. For example, the Office Action does not show that it would be obvious (a) that the contacting creates an interface between the medium, (b) that the layer of curable material has a pattern corresponding to the surface relief pattern, and (c) that the method further comprises using the interface pattern to mechanically influence the orientation of microstructures in the layer, which is recited in Claim 12. See also Claims 13-17. The Office Action does not indicate why it would be obvious from the cited references that physically contacting the surface relief features comprises forming indentations in the layer of curable material. Additionally, the Office Action does explain why it is obvious from the references cited that the illuminating comprises directing substantially incoherent light on the contact area and that the incoherent light has a coherence length of less than or equal to about several wavelengths, or that the contact area is illuminated with white light or sunlight as recited in Claims 50-52.

Claims 1-5, 8-23, 25-59, and 99 are therefore patentable over the cited reference. Accordingly, Applicants respectfully request that the rejection of Claims 1-5, 8-23, 25-59, and 99 under 35 U.S.C. §103(a) be withdrawn.

CONCLUSION

Applicants have endeavored to address all of the concerns expressed in the outstanding Office Action. In light of the above remarks, reconsideration and withdrawal of the outstanding rejections is specifically requested.


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Any claim amendments which are not specifically discussed in the above remarks are not made for patentability purposes, and it is believed that the claims would satisfy the statutory requirements for patentability without entry of such amendments. If the Examiner finds any remaining impediment to the prompt allowance of these claims that could be clarified with a telephone conference, the Examiner is respectfully requested to initiate the same with the undersigned.

Respectfully submitted,

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